Acta orthop. scand. 49, 382–383, 1978

PHYSICAL PROPERTIES OF FLUOROSIS BONE

Critical Comments

OLOV LINDAHL & LARS LINDWALL

Department of Orthopaedic Surgery, Linköping University
Medical School, Linköping, Sweden

Key words: bone disease: fluoride poisoning; statistics; physical bone strength tests

In 1976 Franke and co-workers reported a study of the physical properties of bone from patients who had been exposed to fluorine for many years.[1] In addition the ash from a rib and an iliac crest was examined and found to contain considerable amounts of fluorine. In the mechanical tests, determinations were made of the fracture load and bending strength of complete bones or parts of bones, and of the fracture load per unit of area and the modulus of elasticity of cylindrical test bodies made from bone specimens.

As the thickness of the femoral cortex was greater in the two patients with abnormal amounts of fluorine in the bone than it was in the three control subjects, the tests on the unmodified bone specimens gave a greater strength for the thicker than for the thinner bones. The specific mechanical tests on the cylindrical test bodies yielded the opposite result, the compressive strength being much lower for the bone from the fluorosis patients. In determinations on the same specimens Young's modulus of elasticity was lower in the fluorosis group. The micro-hardness determined by Vicker's method was likewise greater for these specimens.

So far, so good. But then it was maintained that the observed differences were due to the *fluorosis*, and this conclusion is not justified by the results presented. From a statistical standpoint the observed differences cannot be regarded as significant simply because many tests were made on the same specimens. For valid conclusions regarding differences between patient groups a large number of *independent* observations is required. Observations made on one and the same specimen are not independent.

While the observations are consistent with information in the literature concerning the properties of fluoridated bone, as indicated above, the recorded changes cannot with certainty be ascribed to the fluorosis. What has been demonstrated is only that certain mechanical properties observed in the bones of two persons differed from the mechanical properties observed in the bones of three other persons.

Even if a larger patient material had been available and an analysis of many independent observations had been made, it would have only been justifiable to maintain that fluoridated bone has different properties from normal bone; it would have remained to be proven that these differences were due to the fluorosis as such and not to, for example, some other factor that was responsible for both the fluorosis and the hardness of the bone.

In a sociological monograph it was shown some years ago that married couples

[1] Physical properties of fluorosis bone, J. Franke, H. Runge, P. Grau, F. Fengler, C. Wanka & H. Rempel, *Acta orthop. scand.* **47**, 20–37, 1976.

with a large area of parquet flooring in their home were on average significantly happier in their married life than couples with only a small area of such flooring. Even so, no family counsellor would consider prescribing an increase in the area of parquet flooring as a recipe for connubial bliss. Conclusions of this kind are not acceptable in science whether in sociological or in orthopaedic contexts.

Correspondence to: Prof. Olov Lindahl, Department of Orthopaedic Surgery, Linköping University Medical School, Linköping, Sweden.